

Preliminary Amendment  
Serial No.: filed concurrently  
August 27, 2001

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crosslinkable compound which has a reactive double bond and a glycidyl group in its molecule.

IN THE DRAWINGS

Submitted herewith is a proposed drawing change for Fig. 4 shown in red that designates the correct amount of the liquid passed (L). It is respectfully requested that the Examiner approve this proposed drawing change when acting on this Amendment.

REMARKS


By this amendment, the specification and claims 1, 3, 5, 7, 8, 9, 12, 13 and 15-18 have been amended. This Amendment includes the changes made by the Article 34 Amendment in the International Application and removes the multiple dependent claims.

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If there are any questions or concerns regarding this amendment or the remarks, the Examiner is requested to telephone the undersigned at the telephone number listed below.

Respectfully submitted,

  
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VERSION WITH MARKING TO SHOW CHANGES MADE

Submitted herewith is a marked-up version of the amended paragraphs and claims to show the changes made in the foregoing Amendment.

IN THE SPECIFICATION

The paragraph beginning on page 3, line 19 and ending on page 3, line 26 has been amended as follows:

-- The present invention has been accomplished under these circumstances, and a first object of the present invention is to provide a metal chelate forming fiber that has satisfactory capturing property for [capability of] harmful heavy metal ions, can be easily discarded and incinerated, moreover, can be produced at low cost in a simple and safe manner. It is a second object of the invention to provide a process for easily, safely, and efficiently producing the metal chelate forming fiber.--

The paragraph beginning on page 4, line 1 and ending on page 4, line 9 has been amended as follows:

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-- A third object of the present invention is to provide a method of easily and efficiently capturing metal ions contained in trace amounts, for example, in an aqueous or oily liquid or in a gas such as an exhaust gas and the like by the use of the metal chelate forming fiber. Additionally, a fourth object of the present invention is to provide a metal chelate fiber which is making use of catalytic activities or antimicrobial activities of a variety of metals by allowing the metals to be bonded by chelation to a surface of the metal chelate forming [chelate-forming] fiber.--

The paragraph beginning on page 4, line 13 and ending on page 4, line 21 has been amended as follows:

--The present invention has been accomplished to achieve the above objects and provides a metal chelate forming [chelate-forming] fiber. The subject matter of the present invention is that at least one metal chelate forming [chelate-forming] compound selected from the group consisting of aminodicarboxylic acids, thiocarboxylic acid and phosphoric acid which are reactive to epoxy group is bonded to a fiber molecule of a natural fiber or regenerated fiber through a graft reaction product of a

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crosslinkable compound which has a reactive double bond and a glycidyl group in its molecule.--

The paragraph beginning on page 8, line 9 and ending on page 8, line 20 has been amended as follows:

--Additionally, the fiber molecule allows the crosslinkable compound to [be] easily graft onto [introduced into] the fiber molecule by reacting the crosslinkable compound having a double bond and a glycidyl group in its molecule in the presence of a redox catalyst. After the introduction of the crosslinkable compound, the fiber molecule is subjected to reacting with a metal chelate forming compound which is reactive with a glycidyl group to thereby easily impart chelating capability to the fiber molecule. In this procedure, iminodiacetic acid, ethylenediaminediacetic acid, ethylenediaminetriacetic acid, thioglycolic acid, thiomalic acid or phosphoric acid are used as the preferable chelate forming [chelate-forming] compound.--

The paragraph beginning on page 8, line 21 and ending on page 9, line 9 has been amended as follows:

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--Consequently, the natural or regenerated fiber has a multitude of metal chelate forming [chelate-forming] functional groups introduced onto a surface of its fiber molecule. Nitrogen atoms, sulfur atoms, carboxyl groups or other moieties present in the chelate-forming functional groups satisfactorily exhibit the selective adsorption of copper, zinc, nickel, cobalt and other heavy metal ions. Additionally, since the chelate-forming functional groups are attached to the surface while being grafted to the fiber molecule, and the metal chelate-forming fiber satisfactorily exhibit the selective adsorption of metal ions by action of the chelate-forming functional groups present in the fiber molecule. Furthermore, as the metal chelate-forming fiber comprises a natural or regenerated fiber as a base fiber, the biodegradation is expected when the fiber is discarded, and a harmful gas is hardly generated when it is incinerated.--

IN THE CLAIMS

--1. (Amended) A metal chelate forming fiber characterized in that at least one metal chelate-forming compound selected from the group consisting of aminodicarboxylic acids, thiocarboxylic acid and phosphoric acid which are reactive to epoxy group is bonded to

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a fiber molecule of a natural fiber or regenerated fiber through a graft reaction product of a crosslinkable compound which has a reactive double bond and a glycidyl group in its molecule.--

--3. (Amended) The metal chelate-forming fiber according to claim 1 [or 2], wherein said metal chelate forming compound is at least one selected from the group consisting of iminodiacetic acid, ethylenediaminediacetic acid, ethylenediaminetriacetic acid, thioglycolic acid, thiomalic acid and phosphoric acid.--

5. (Amended) The metal chelate-forming fiber according to [any one of claims] claim 1 [to 4], wherein said natural or regenerated fiber is a vegetable fiber.

--7. (Amended) The metal chelate-forming fiber according to [any one of claims] claim 1 [to 4], wherein said natural fiber is an animal fiber.--

--8. (Amended) The metal chelate-forming fiber according to [any one of claims] claim 1 [to 7], wherein said fiber is powdery.--

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--9. (Amended) The metal chelate-forming fiber according to [any one of claims] claim 1 [to 7], wherein said fiber is a filter material.--

-- 12. (Amended) The process according to claim 10 [or 11], wherein said metal chelate forming compound is at least one selected from the group consisting of iminodiacetic acid, ethylenediaminediacetic acid, ethylenediaminetriacetic acid, thioglycolic acid, thiomalic acid and phosphoric acid.--

--13. (Amended) The process according to [any one of claims] claim 10 [to 12], wherein said redox catalyst is a combination of a divalent iron salt, hydrogen peroxide and thiourea dioxide.--

-- 15. (Amended) A method of capturing metal ions, comprising

bringing the metal chelate-forming fiber [according to any one of claims 1 to 9] comprising at least one metal chelate-forming compound selected from the group consisting of aminodicarboxylic acids, thiocarboxylic acid and phosphoric acid which are reactive to epoxy group is bonded to a fiber molecule of a natural fiber or regenerated fiber through a graft reaction



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product of a crosslinkable compound which has a reactive double bond and a glycidyl group in its molecule, into contact with an aqueous liquid containing metal ions to thereby capture the metal ions from the aqueous liquid.--

--16. (Amendment) A method of capturing metal ions, comprising bringing the metal chelate-forming fiber [according to any one of claims 1 to 9] comprising at least one metal chelate-forming compound selected from the group consisting of aminodicarboxylic acids, thiocarboxylic acid and phosphoric acid which are reactive to epoxy group is bonded to a fiber molecule of a natural fiber or regenerated fiber through a graft reaction product of a crosslinkable compound which has a reactive double bond and a glycidyl group in its molecule, into contact with an oily liquid containing metal ions to thereby capture the metal ions from the oily liquid.--

--17. (Amendment) A method of capturing metal ions, comprising bringing the metal chelate-forming fiber [according to any one of claims 1 to 9] comprising at least one metal chelate-forming compound selected from the group consisting of aminodicarboxylic acids, thiocarboxylic acid and phosphoric acid

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which are reactive to epoxy group is bonded to a fiber molecule of a natural fiber or regenerated fiber through a graft reaction product of a crosslinkable compound which has a reactive double bond and a glycidyl group in its molecule, into contact with a gas containing metal ions to thereby capture the metal ions from the gas.--

--18. (Amendment) A metal chelate fiber characterized in that a metal is bonded by chelation to the metal chelate-forming fiber [according to any one of claims 1 to 9] comprising at least one metal chelate-forming compound selected from the group consisting of aminodicarboxylic acids, thiocarboxylic acid and phosphoric acid which are reactive to epoxy group is bonded to a fiber molecule of a natural fiber or regenerated fiber through a graft reaction product of a crosslinkable compound which has a reactive double bond and a glycidyl group in its molecule.--